Plugin design process

Vincent Van den Broeck

Designing a VST plugin based off technical research

Introduction

This document explains how I designed a new audio plugin using technical research and analysing the results of experiments with a technology I've never used before.

Design process in steps

1. Research technology (in this case FFT)
2. Implement technology in the easiest way possible. For this project I'm using JUCE so this step involves setting up the FFT library in JUCE and writing a base FFT effect class.
3. Experiment with the technology, make 3 demo effects.
4. Analyse demo effects; what are the most interesting and/or useful parts about the plugins? What happens when you combine them? What audio sources work best with the plugin?
5. Take the most interesting/useful/innovative parts of each plugin and combine them into a final product.
6. Optional: add addiotional features that enhance the unique character of the plugin

Demo plugins

ReEsser

Based on the commonly used DeEsser plugin, this plugin amplifies frequencies in a specific bandwidth when they go over a certain threshold. An interesting effect happens when you max out the bandwidth so it processes the whole frequency spectrum. Used on an audio group this glues the sounds together in a way that's inpredictable yet satisfying to listen to.

Chordifyer

This plugin implements a very basic Vocoder like algorhtym. The effect of this plugin is heavily influenced by the audio you send into the sidechain input. Therefore this plugin has a lot of different ways it can manipulate audio.

Squarer

The squarer plugin uses a square oscillator to filter out frequencies of the source audio. Only frequencies in the square wave will be let through. This creates a digital filter like effect. Using a LFO on the frequency of the square wave you can also modulate the frequency center of the source audio.

Matrices

Matrix 1: plugin / creative possibilities

	Innovative?	Artistic capabilities?	Useful?	Most interesting
ReEsser	4/5	4/5	3/5	Wide bandwidth mode
Chordifyer	3/5	5/5	4/5	Vocal/complex input
Squarer	3/5	1/5	2/5	Frequency mod

Matrix 2: plugin / use cases

	Source audio 1	Use case 1	Source audio 2	Use case 2
ReEsser	Vocals	Mixing	Audio group	Creative glue effect
Chordifyer	Softsynth	Formant filter	Instrument recording	Formant filter
Squarer	Softsynth	Square filter	Percussive oneshots	Add tonal information

Matrix 3: plugin / plugin (most interesting combination effect)

	ReEsser	Chordifyer	Squarer
ReEsser		Formant filter with instable amplified frequency band	More pronounced square filter
Chordifyer	Formant filter with amplified frequency band		Digital sounding formant filter
Squarer	Instable square filter	Soft filter for chordifyer	

Creative matrix conclusion

Most interesting: ReEsser wide bandwidth + chordifyer sidechain input.

Idea: SoundScaper plugin. The plugin glues instruments on a group bus together to turn it into a soundscape-like sound. The plugin is designed to work for soft-synths and recorded instruments with long sustain.

Plugin DSP

The plugin contains the following processing units:
- Low and high tilt filters to scape eq curve
- Resonator
- ReEsser 'glue'
- Optional sidechain input for vocoder-like effect

The plugin contains the following ui parameters:
- Low and high filter drive
- Resonator frequency and depth
- ReEsser threshold and mix
- Sidechain input gain and mix

Additional features

One of the most important things of soundscapes is the way they evolve over time. Therefore, I want the user to be able to modulate any parameter of the plugin using a dedicated LFO.